

REMARKS

Claims 1, 8-9, 11 and 21-27 have been canceled without prejudice. Claims 14-20 have been withdrawn without prejudice in response to the restriction requirement. Claims 2-7, 10, 12 and 13 have been amended. Claim 28 has been added. With entry of this amendment, claims 2-7, 10, 12-13 and 28 will be pending.

Claim 7 has been rejected under 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Appropriate amendment has been made. Withdrawal of the rejection is respectfully requested.

Claims 1-4, 6, and 8-13 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,474,723 issued to Horikoshi ("Horikoshi"). Claims 5 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Horikoshi as applied to claims 1-4, 6 and 8-13 above, and further in view of U.S. Patent No. RE 34,239 issued to Wason ("Wason"). Claims 21-25 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Horikoshi as applied to claims 1-4, 6, and 8-13 above, and further in view of U.S. Patent No. 6,177,036 issued to Van Der Hoeven ("Van Der Hoeven"). Claim 26 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Horikoshi in view of Van Der Hoeven as applied to claims 21-25 and 27 above, and further in view of Wason.

Independent Claim 28 and Dependent Claims 2-7 and 13

New independent claim 28 specifies a method of co-injection molding. Support for claim 28 can be found, *inter alia*, on page 8, lines 4-10. The method comprises:

mixing a plastic inner material and an endothermic-blowing agent to form a core mixture;

injecting a plastic outer material from a first injection unit into a co-injection manifold to create a flow of outer material therethrough;

injecting the core mixture from a second injection unit into the co-injection manifold to create a flow of core mixture therethrough;

controlling the flow of the outer material and the flow of the core mixture through the co-injection manifold and into a mold cavity thereby co-injection molding the core mixture inside the outer material;

terminating the flow of the core mixture and subsequently terminating the flow of the plastic material; and

expanding the core mixture by providing heat for the endothermic-blowing agent to absorb.

Horikoshi discloses in its Summary of the Invention, that the “invention concerns a method for the production of a shaped article of resin possessing a two-ply construction having the outer side of a core-layer resin wrapped with a skin-layer resin, which method is characterized by the steps of injecting a skin-layer resin into the cavity of a mold and subsequently or simultaneously injecting a core-layer resin foamed by incorporation of a foaming agent therein.” Col. 2, lines 18-25. “To be specific, the production is accomplished by filling the apparatus constructed as illustrated in FIG. 1 with the core-layer resin 2, then retracting the core-layer screw 4 thereby decreasing the pressure acting upon the core-layer resin 2, foaming the core-layer resin subsequently advancing the core-layer screw 4, and injecting the core-layer resin 2 thereby forming a fully foamed core layer.” Col. 4, lines 1-7.

Horikoshi does not teach or suggest “terminating the flow of the core mixture and subsequently terminating the flow of the outer material” as claimed. This allows the Applicant to completely encapsulate the core mixture with the outer material. In contrast, Horikoshi, as well as similar sandwich molding methods, leave the core mixture exposed at at least one end. In other words, Horikoshi’s end product is not “capped off.” Capping off the product enables expansion of the core mixture to occur within the mold cavity, and even after the part has been removed from the mold. When the product is not capped off, the product must remain in the mold until expansion is complete, otherwise the core mixture will expand from the exposed area ruining the part.

Horikoshi found an alternative way to address this problem, which is associated with sandwich molding. In other words, Horikoshi enables expansion of its core-layer resin to occur before the core mixture is even injected through into the cavity of the mold. Again, this is done by “filling the apparatus constructed as illustrated in FIG. 1 with the core-layer resin 2, then retracting the core-layer screw 4 thereby decreasing the pressure acting upon the core-layer resin 2, foaming the core-layer resin subsequently advancing the core-layer screw 4, and injecting the core-layer resin 2 thereby forming a fully foamed core layer.” Col. 4, lines 1-7. However, this results in slower cycle times because the core layer screw needs to be retracted and the pressure decreased with each shot. Applicants claimed method provides faster cycle times by capping the part, using true “co-injection molding” rather than “sandwich molding.” Again, this allows foaming to take place in the mold cavity, and even after the part has been removed from the cavity.

Accordingly, Horikoshi does not teach or suggest the subject matter of new independent claim 28. Consideration and allowance of claim 28 are respectfully requested.

Claims 2-7 and 13 depend from allowable claim 28, and are therefore allowable. Moreover, claims 2-7 and 13 may contain additional patentable subject matter for reasons that may or may not be set forth herein. Reconsideration and allowance of claims 2-7 and 13 are respectfully requested.

Independent Claim 10

Independent claim 10 has been rewritten in independent form to substantially include the limitations of base claim 1 and intervening claim 8. Some of the language from previous claims 8 and 1 has been deleted as shown above to avoid redundancies. This claim has not been narrowed and amended for reasons related to patentability.

Independent claim 10 recites a method of co-injection molding. The method comprises: mixing a plastic inner material and an endothermic-blowing agent to form a core mixture;

injecting a plastic outer material from a first injection unit into a co-injection manifold to create a flow of outer material therethrough;

injecting the core mixture from a second injection unit into the co-injection manifold to create a flow of core mixture therethrough;

allowing the core mixture to enter the mold cavity only after the outer material enters the mold cavity, and then allowing the core mixture and the outer material to flow into the mold cavity concurrently, thereby co-injection molding the core mixture inside the outer material;

stopping the flow of the core mixture into the mold cavity before stopping the flow of the outer material into the mold cavity; and
expanding the core mixture by providing heat for the endothermic-blowing agent to absorb.

For the same and similar reasons as set forth above with respect to claim 28, claim 10 is allowable. More particularly, claim 10 recites, among other things, allowing the core mixture to enter the mold cavity only after the outer material enters the mold cavity, and then allowing the core mixture and the outer material to flow into the mold cavity concurrently, thereby co-injection molding the core mixture inside the outer material and stopping the flow of the core mixture into the mold cavity before stopping the flow of the outer material into the mold cavity. This allows the Applicant to completely encapsulate the core mixture with the outer material. In contrast, Horikoshi, as well as similar sandwich molding methods, leave the core mixture exposed at at least one end. In other words, Horikoshi's end product is not "capped off." Capping off the product enables expansion of the core mixture to occur within the mold cavity, and after the part has been removed from the mold.

This alleviates the slower cycle times resulting from Horikoshi's process. Again, Horikoshi only enables expansion of its core-layer resin to occur before the core mixture is even injected through into the cavity of the mold by "filling the apparatus constructed as illustrated in FIG. 1 with the core-layer resin 2, then retracting the core-layer screw 4 thereby decreasing the pressure acting upon the core-layer resin 2, foaming the core-layer resin subsequently advancing the core-layer screw 4, and injecting the core-layer resin 2 thereby forming a fully foamed core layer." Col. 4, lines 1-7.

Accordingly, claim 10 is allowable. Reconsideration and allowance of amended independent claim 10 are respectfully requested.

Independent Claim 12

Independent claim 12 has been rewritten in independent form to substantially include the limitations of base claim 1 and intervening claims 8 and 11. Some of the language from previous claims 1, 8 and 11 has been deleted as shown above to avoid redundancies. This claim has not been narrowed and amended for reasons related to patentability.

Independent claim 12 recites a method of co-injection molding. The method comprises:

mixing a plastic inner material and an endothermic-blowing agent to form a core mixture;

injecting a plastic outer material from a first injection unit into a co-injection manifold to create a flow of outer material therethrough;

injecting the core mixture from a second injection unit into the co-injection manifold to create a flow of core mixture therethrough;

allowing the core mixture to enter the mold cavity only after the outer material enters the mold cavity, and then allowing the core mixture and the outer material to flow into the mold cavity concurrently, thereby co-injection molding the core mixture inside the outer material;

stopping the flow of the outer material after the outer material concurrently flows with the core mixture, thereby allowing the core mixture to remain flowing;

stopping the flow of the core mixture into the mold cavity, and resuming the flow of the outer material into the mold cavity; and

expanding the core mixture by providing heat for the endothermic-blowing agent to absorb.

For the same and similar reasons as set forth above with respect to claim 28 and claim 10, claim 12 is allowable. More particularly, claim 12 recites, among other things, allowing

the core mixture to enter the mold cavity only after the outer material enters the mold cavity, and then allowing the core mixture and the outer material to flow into the mold cavity concurrently, thereby co-injection molding the core mixture inside the outer material; stopping the flow of the outer material after the outer material concurrently flows with the core mixture, thereby allowing the core mixture to remain flowing; and stopping the flow of the core mixture into the mold cavity, and resuming the flow of the outer material into the mold cavity. This allows the Applicant to completely encapsulate the core mixture with the outer material. In contrast, Horikoshi, as well as similar sandwich molding methods, leave the core mixture exposed at at least one end. In other words, Horikoshi's end product is not "capped off." Capping off the product enables expansion of the core mixture to occur within the mold cavity, and after the part has been removed from the mold.

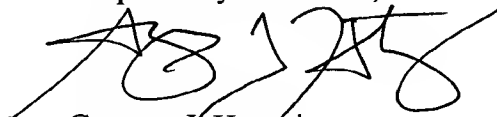
This alleviates the slower cycle times resulting from Horikoshi's process. Again, Horikoshi only enables expansion of its core-layer resin to occur before the core mixture is even injected through into the cavity of the mold by "filling the apparatus constructed as illustrated in FIG. 1 with the core-layer resin 2, then retracting the core-layer screw 4 thereby decreasing the pressure acting upon the core-layer resin 2, foaming the core-layer resin subsequently advancing the core-layer screw 4, and injecting the core-layer resin 2 thereby forming a fully foamed core layer." Col. 4, lines 1-7.

Accordingly, claim 12 is allowable. Reconsideration and allowance of amended independent claim 12 are respectfully requested.

CONCLUSION

In view of the foregoing, allowance of claims 2, 7, 10, 12-13 and 28 is respectfully requested. Should any issues remain, the Examiner is strongly encouraged to contact the undersigned at the telephone number listed below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'G. J. Hartwig', written over a horizontal line.

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